PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : E01F 15/04, 15/08 — A1

(11) International Publication Number: WO 98/53146

(43) International Publication Date: 26 November 1998 (26.11.98)

(21) International Application Number: PCT/EP98/02928

(22) International Filing Date: 19 May 1998 (19.05.98)

(30) Priority Data:
TO97000428 20 May 1997 (20.05.97) IT

(71) Applicant *(for all designated States except US)*: TRAPIL-METAL S.R.L. [IT/IT]; Via Enrico Fermi, 79, I-10091 Alpignano (IT).

(72) Inventors; and

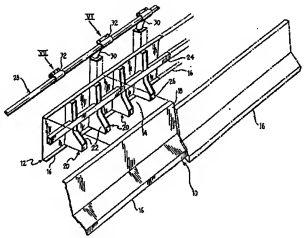
(75) Inventors/Applicants *(for US only)*: LA CAMERA, Francesco, Maria [IT/IT]; S.T.E. S.r.l., Viale Angelico, 77, I-00195 Roma (IT). TEMUSSI, Marco [IT/IT]; S.T.E. S.r.l., Viale Angelico, 77, I-00195 Roma (IT).

(74) Agents: GERBINO, Angelo et al.; Jacobacci & Perani S.p.A., Corso Regio Parco, 27, I-10152 Torino (IT).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ROAD SAFETY BARRIER



(57) Abstract

The safety barrier, intended to be located longitudinally along the edges of a roadway, includes: an inner lateral wall (10) intended to face the roadway; an outer lateral wall (12) intended to face away from the roadway, the lateral walls (10, 12) together defining a cavity (14); and means for anchorage to the ground or to a fixed element (50) underlying the barrier, including at least one ground anchor (52) having a rod (54) with a lower portion capable of penetrating the ground or the element (50). The barrier further includes a support structure (66) for the ground anchor (52), positioned between the lateral walls (10, 12) and which has an internal cavity (68) for the rod (54) to pass through. The walls of the cavity (68) are spaced apart at least by the upper portion of the rod (54) adjacent the portion capable of penetrating the ground so that the structure (66) and the rod (54) are able to deform plastically as the result of the forces arising upon collision of a vehicle with the barrier.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

Road safety barrier

The present invention concerns a safety barrier intended to be installed longitudinally along the edges of a roadway.

The purpose of such barriers, described in more detail in the preamble to the principal claim, is to prevent vehicles from leaving the road while, at the same time, guaranteeing the safety of the passengers. They must therefore be capable of absorbing as much as possible of the energy of the vehicles that collide with them, and have the mechanical strength to ensure that these vehicles are restrained and do not overturn.

In particular the present invention relates to barriers used on structures such as bridges, viaducts and supporting walls, and which must therefore combine the mechanical properties described above with a low weight which is compatible with the severely limited loads supportable by such structures.

The object of the present invention is to provide a security barrier which, as well as satisfying the requirements mentioned above, is easy and safe to assemble.

According to the present invention, this object is achieved by a safety barrier and an associated method of production having the characteristics specifically referred to in the following claims.

In particular, the safety barrier according to the invention is characterised by the presence of support structures in the form of ground anchors for fixing to an underlying ground beam, which support structures are capable of plastic deformation and of enabling the plastic deformation of the ground anchors as the result of the forces to which they are subjected upon collision of a vehicle with the barrier.

In this way, a significant amount of the kinetic energy of the impacting vehicle is absorbed, consequently reducing the forces in play and the risk of the barrier breaking and the vehicle overturning, as well as obtaining the most favourable exit path due to the reduction in the elastic restoration.

Preferably, these support structures have selective connection means for connecting to the other components of the barrier, such that they can be removed or their positions changed during installation.

The installation of the barrier may thus involve the initial formation of a continuous outer lateral wall which provides effective protection for those responsible for the subsequent operations such as anchoring and assembling the inner wall.

Further advantages and characteristics of the present invention will become clear from the following detailed description, given purely by way of non-limitative example and with reference to the accompanying drawings in which:

Figure 1 is an exploded perspective view of a portion of a road barrier according to the invention;

Figure 2 is a side view of the barrier of the invention in the assembled condition;

Figure 3 is a plan view in section taken on the line III-III of Figure 2;

Figure 4 is a sectional view taken on the line IV-IV of Figure 3;

Figure 5 is a view similar to that of Figure 4, showing the possible deformation to which the components of the barrier are subjected upon collision of a motor vehicle;

Figure 6 is a plan view of a portion of a retaining bar of the barrier according to the invention;

Figure 7 is a plan view of a further portion of the retaining bar of the barrier according to the invention; and

Figure 8 is a sectional view taken on the line VIII-VIII of Figure 7.

A security barrier, intended to be positioned longitudinally along the edge of a roadway, includes (Figure 1) an inner lateral wall 10 intended to face the carriageway, and an outer lateral wall 12 intended to face away from the carriageway. These lateral walls together define a cavity 14.

Both the inner and outer walls 10, 12 are formed from a series of sheets 16 joined together in series using conventional methods such as bolting, riveting and the like, and which are not shown in detail. The connection zones of the sheets 16 forming the outer wall 12 are longitudinally offset with respect to those of the sheets forming the inner wall 10, thus increasing the cohesion of the barrier.

In addition, and in order to increase this cohesion, the juxtaposed ends of the sheets 16 forming the inner wall 10 are superimposed over a short portion 18. The inner wall 10 is preferably shaped with the well-known "New Jersey" shape.

In addition, longitudinally-spaced reinforcing posts 20 which project transversely into the cavity 14 are fixed to the sheets 16 forming the lateral walls 10, 12. The posts 20 have a C-section with two opposite transverse ribs 22 supporting a longitudinal reinforcing girder 24. The posts 20 also have a base plate 26 with which are associated barrier-anchorage means, as will be described in more detail below.

Furthermore, this latter includes a retaining bar 28 which extends longitudinally above the lateral walls 10, 12 to which it is connected by longitudinally-spaced supports 30.

The bar 28 is formed from several tubular elements arranged in series. The junction between two consecutive elements and intermediate portions of the various elements are surrounded by associated tubular sleeves 32 which are open along a generatrix 34 (Figures 6, 7 and 8). The edges of each sleeve 32 along the

open generatrix 34 are extended as respective facing flanges 36 provided with locking means.

These latter comprise bolts 38, each having a nut and a screw capable of passing through axial holes 40 in the flanges 36.

Each sleeve 32 attached (Figures 7 and 8) at the junction between two consecutive elements has, disposed symmetrically in relation to the centre of the junction, first and second pairs of diametrically-opposed holes 42 capable of enabling an associated screw 44 to pass through. This screw passes through corresponding holes 46 formed through the end of the associated bar element 28 and can be locked with a nut 48.

As already indicated, the barrier has means for anchoring it to the ground or to a fixed underlying structure, in particular, a ground beam 50 (Figures 3 and 4).

These anchorage means include a plurality of ground anchors 52 - for example, of the HILTI type - having a threaded rod 54 capable of passing through an associated aperture 56 the dimensions of which are significantly greater than those of the rod, which aperture is formed in the base plate 26 of each post 20. The lower portion of the rod 54 is capable, as will be described in more detail below, of expanding and anchoring to the underlying ground beam 50. In addition to the rod 54, each ground anchor 52 includes a nut 58 capable of being screwed to the upper end of the rod 54, a washer 60 from the base of which projects a sleeve 62, and a tubular sheath 64 which surrounds the lower end of the rod 54.

Each ground anchor 52 is supported by an associated support structure 66 which has a cavity 68 for the rod 54 to pass through, and is positioned between the facing ribs 22 of an associated post 20 and over its base plate 26.

The support structure 66 is box-like and includes an apertured

prism 70 having a quadrilateral base, the sides of which substantially parallel to the lateral walls 10, 12 are fixed to the middle portion of associated sections 72, these also extending substantially parallel to the lateral walls 10, 12. Each section 72 is formed from a first, substantially vertical limb 74 to which one side of the prism 70 is fixed, and a second, substantially horizontal limb 76 intended to rest on the base plate 26. The limbs 74, 76 are joined together by a curved intermediate portion 78 of the section 72.

Because of this conformation of the support structure 66, the walls of the inner cavity 68 are spaced from the upper portion of the rod 54 adjacent the portion which can pass through the aperture 56 formed in the base plate 26. The upper portion of the rod 54, in turn, passes through the sleeve 62 disposed within the hole 84 of the prism 70, and projects above the washer 60 to enable the nut 58 to screw thereto.

The ends of the sections 72 are fixed to transverse plates 80 provided with holes 82 through which pass bolts (for greater clarity, these are not illustrated in the drawings) for fixing to the ribs 22 of the post 20.

The procedure for installing the barrier described above envisages the initial continuous formation of the outer lateral wall 12 (Figure 1) to which the reinforcing posts 20 are fixed, each post having an associated support structure 66 for a ground anchor 52.

The outer wall 12 thus constitutes a continuous parapet which functions to protect those persons involved in the subsequent phases of the installation, while the support structures 66 constitute a precise reference for the formation of anchorage holes 86 in the ground beam 50 (Figures 3 and 4) into which the lower ends of the rods 54 of the ground anchors 52 are to be inserted.

To form the holes 86, in fact, the tip of the boring tool is made to pass through the hole 84 of the prism 70 of a support structure 66 (as well as through the aperture 56 formed in the base plate 26), and is thus guided with precision.

The various support structures 66 are then removed by unscrewing the associated bolts, not shown, which fix the plates 80 to the ribs 22. It is thus possible to form a second series of anchorage holes 88 in the ground beam 50, which constitute a widening of the upper portion of the first anchorage holes 86 so that they are offset with respect to these latter. In this case, the tip of the boring tool is made to pass through the apertures 56, and uses the previously-formed first anchorage holes 86 as a reference.

Once this operation is finished, each of the support structures 66 is returned to its original position (Figure 3 and 4) and installation continues with the insertion of the associated rod 54 of the ground anchor 52 into the cavity 68 and the anchorage holes 86, 88, and location of the sleeve 62 associated with the washer 60 within the hole 84 of the prism 70.

Then, screwing the nut 58 causes a radial expansion of the lower end 90 of the rod 54 which extends in the undercut 92 at the end of the anchorage hole 86, which has an enlarged section, anchoring the ground anchor 52, and thus the barrier, to the ground beam 50.

At this point it is possible to complete the barrier (Figure 1) in safety by the installation of the retaining bar 28 and the sheets 16 constituting the inner wall 10, which do not need holes or apertures to access the anchorage means as these latter have already been installed.

The retaining bar 28 is formed from various elements locked in the sleeves 32 by the bolts 38 which act on the flanges 36.

As already indicated, the sleeves 32 (Figures 7 and 8) located at the junction of two consecutive elements of the bar 28 have first and second pairs of diametrically-opposed holes 42 capable of enabling an associated screw 44 to pass through, which passes through corresponding holes 46 formed in the associated ends of the elements and is locked with an associated nut 48. In this way, the continuity and the strength of the bar is assured, even at the junctions.

If one of these junctions corresponds with an expansion joint, it is of course possible to provide a looser coupling, leaving sufficient space between the facing ends of the elements and utilising a sleeve without flanges 36 and the associated lock bolts 38.

This structure of the retaining bar 28 enables it effectively to resist vehicles colliding with the barrier overturning while, at the same time, dissipating the energy.

In addition, if a car collides with the barrier, the conformation according to the invention of the anchorage means to the ground beam 50 enables a significant absorption of kinetic energy, considerably reducing the risk to which the vehicle occupants are exposed.

In fact, because the walls of the aperture 56 of the base plate 26 of the post 20, the lower portion of the internal cavity 68 of the support structure 66 and the second anchorage hole 88 are spaced apart from the opposite portions of the rod 54 of the associated ground anchor 52, in the event of collision, this latter is not directly struck by rigid bodies which would cause immediate shearing. On the contrary, the rod 54 undergoes a progressive plastic deformation (Figure 5) which enables a significant absorption of energy before it eventually breaks. Further energy is also absorbed by the deformation of the support structure 66.

This latter can also be in the form of other embodiments, not illustrated, to obtain a comparable result. For example, the sections 72 which support the prism 70, the form of which may be freely chosen, can be L-shaped, C-shaped, with an uneven outline, or they can be replaced by rectangular tubes, round tubes or half tubes.
Furthermore, the support structure 66 may be realised in several stages of differentiated deformability, or in monoblock form.

In addition, the support structure 66 may be provided with any kind of selective connection means for connecting to the other barrier components such that it can be removed or its position altered during the installation of the barrier. Equally, the support structure 66 may simply rest against the base plate 26 and be held in position by the traction exerted by the ground anchor 52.

Naturally, the principle of the invention remaining the same, the details of construction and the embodiments may be widely varied with respect to that described and illustrated by way of example, without by this departing from the ambit of the invention.

CLAIMS

1. A safety barrier intended to be located longitudinally along the edges of a roadway, the said barrier including:
- an inner lateral wall (10) intended to face the said roadway;
- an outer lateral wall (12) intended to face away from the said roadway, the said lateral walls (10, 12) together defining a cavity (14); and
- means for anchoring to the ground or to a fixed element (50) underlying the barrier, including at least one ground anchor (52) having a rod (54) with a lower portion capable of penetrating the ground or the said underlying element (50);
the said barrier being characterised in that it includes a support structure (66) for the said at least one ground anchor (52), positioned between the said lateral walls (10, 12) and with an internal cavity (68) for the rod (54) to pass through, the walls of the said internal cavity (68) being spaced at least from the upper portion of the rod (54) adjacent the portion which can penetrate the ground or the said underlying element (50) such that the said support structure (66) is capable of deforming plastically and enabling the plastic deformation of the rod (54) as the result of forces arising upon collision of a vehicle with the barrier.

2. A barrier according to Claim 1, characterised in that the cavity (14) defined by the lateral walls (10, 12) is closed at least partially at its base by a base plate (26) having an aperture (56) through which the rod (54) passes, the wall of the said aperture (56) being spaced apart from the facing portion of the rod (54).

3. A barrier according to Claim 2, characterised in that the said base plate of the cavity (14) is the base plate (26) of a reinforcing post (20) located within the said cavity (14).

4. A barrier according to any preceding claim, characterised

in that the said support structure (66) is provided with selective connection means for connecting to the other barrier components such that it can be removed or its position altered during the operations to install the barrier.

5. A barrier according to any preceding claim, characterised in that the said support structure (66) is a box-like structure.

6. A barrier according to Claim 5, characterised in that the said support structure (66) includes an apertured prism (70) with a quadrilateral base, the sides of which substantially parallel to the lateral walls (10, 12) are fixed to the median portion of the associated sections (70) which also extend substantially parallel to the said lateral walls (10, 12), each section (70) being formed from a first, substantially vertical limb (74) to which is fixed a side of the said prism (70), and a second, substantially horizontal limb (76) capable of lying on the base plate (26), the said first and second limbs (74, 76) being connected by a curved intermediate portion (78).

7. A barrier according to Claim 6, characterised in that the said sections (70) are fixed to transverse plates (80) with holes (82) through which bolts pass for fixing to ribs (22) on the posts (20).

8. A barrier according to any of Claims 1 to 4, characterised in that the said support structure (66) is in monoblock form.

9. A barrier according to any preceding claim, characterised in that the ground anchor (52) includes the said rod (54) which is threaded, a nut (58) capable of screwing onto the upper end of the rod (54), a washer (60) from the base of which projects a sleeve (62) capable of penetrating the hole (84) of the prism (70) and a tubular sheath (64) which surrounds the lower end of the rod (54).

10. A barrier according to any preceding claim, characterised in that it includes a retaining bar (28) which extends longitudinally over the said lateral walls (10, 12) to which it is connected by longitudinally-spaced supports (30), the said bar (28) being formed from several elements disposed in series, the junction between two consecutive elements and/or an intermediate tract of an element being surrounded by associated tubular sleeves (32) open along a generatrix (34), the edges of the sleeve (32) along the said open generatrix (34) are extended as respective facing flanges (36) provided with locking means.

11. A barrier according to Claim 10, characterised in that the said locking means include at least one bolt (38) having a nut and a screw is capable of passing through holes (40) formed axially on the said facing flanges (36).

12. A barrier according to any of Claims 10 and 11, characterised in that the sleeve (32) located at the junction between two consecutive elements has first and second pairs of diametrically-opposed holes (42), symmetrical with respect to its centre, capable of enabling an associated screw (44) to pass through, which passes through corresponding holes (46) formed through the associated ends of the elements and which are able to be locked by an associated nut (48).

13. A barrier according to any preceding claim, characterised in that both the said inner wall (10) and the said outer wall (12) are formed from a series of sheets (16) joined in series, the connection zones of the sheets (16) forming the outer wall (12) being longitudinally offset with respect to those of the sheets (16) forming the inner wall (10).

14. A barrier according to Claim 13, characterised in that the juxtaposed ends of the sheets (16) forming the inner wall (10) are superimposed over a short portion (18).

15. A method for the installation of a barrier according to any preceding claim, characterised in that it involves the initial continuous formation of the said outer lateral wall (12) which thus constitutes a protective parapet for those responsible for the subsequent operations, such as the anchorage and assembly of the inner wall (10).

16. A method according to Claim 15, characterised in that the said rod (54) of the ground anchor (52) is inserted into an anchorage hole (86) formed in the ground or in the said underlying element (50), the upper portion (88) of the hole (86) being of dimensions substantially greater than those of the rod (54) to enable the plastic deformation of this latter in the event that a vehicle collides with the barrier.

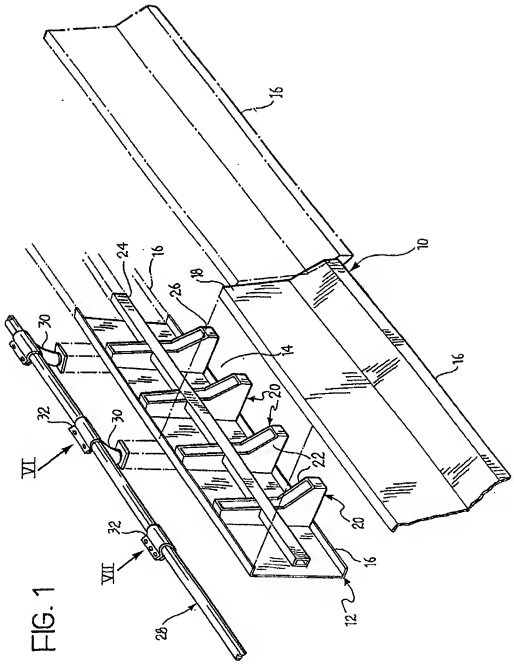
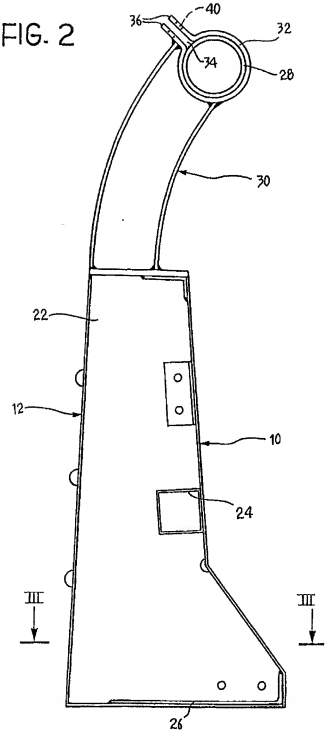


FIG. 1

FIG. 2



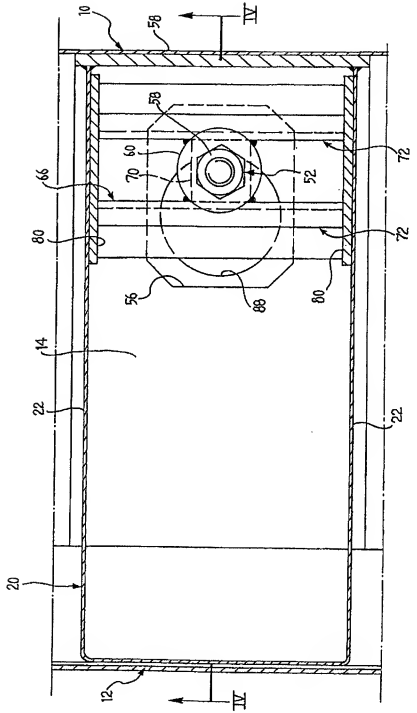


FIG. 3

FIG. 4

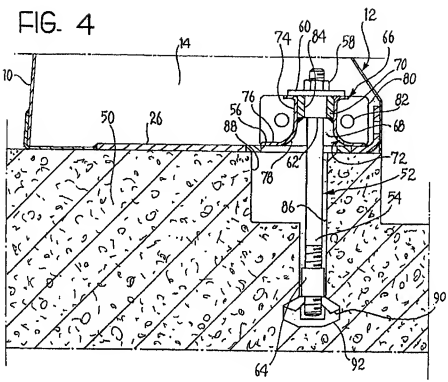
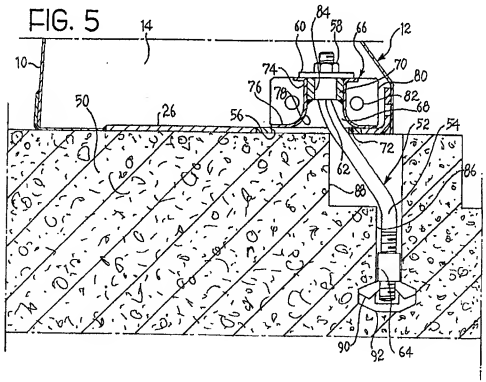

12
14
74
60
84
58
66
10
70
80
76
82
56
88
68
50
26
72
62
78
52
54
86
90
64
92

FIG. 5


84
14
60
58
66
12
10
74
70
80
76
78
82
68
50
26
56
52
54
72
62
86
88
90
92
64

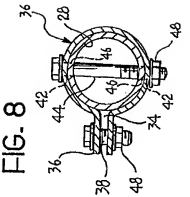


FIG. 8

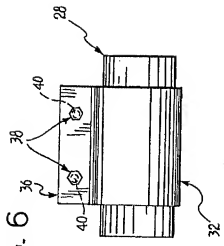


FIG. 6

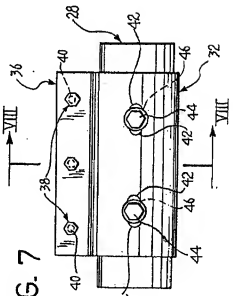


FIG. 7

INTERNATIONAL SEARCH REPORT

Inta .onal Application No
PCT/EP 98/02928

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E01F15/04 E01F15/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 95 03453 A (AUTOSTRADA CONCESSIONI) 2 February 1995 see the whole document	1-5,8,9, 13-16 6,10
A	EP 0 575 705 A (SERAFIN) 29 December 1993 see the whole document	1-6,8-16
A	DE 39 29 819 A (SPS) 4 October 1990 see column 3, line 11 - line 60; figures	1-16
A	PATENT ABSTRACTS OF JAPAN vol. 14, no. 407 (M-1019), 4 September 1990 & JP 02 157308 A (KYOKUTO KOGEN CONCRETE SHINKO KK), 18 June 1990 see abstract	1-3,9, 15,16

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publicationdate of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 September 1998	23/09/1998
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Verveer, D

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intl. Jonal Application No
PCT/EP 98/02928

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9503453 A	02-02-1995	IT 1262381 B	19-06-1996
		AT 160402 T	15-12-1997
		AU 6980694 A	20-02-1995
		DE 69406930 D	02-01-1998
		DE 69406930 T	18-06-1998
		EP 0710309 A	08-05-1996
		ES 2111932 T	16-03-1998
		US 5697728 A	16-12-1997
EP 575705 A	29-12-1993	IT UD920013 U	14-10-1993
		AT 147814 T	15-02-1997
		CZ 282647 B	13-08-1997
		DE 69307403 D	27-02-1997
		DE 69307403 T	10-07-1997
		ES 2096123 T	01-03-1997
		GR 3022485 T	31-05-1997
		HU 213494 B	28-07-1997
		SK 34793 A	10-11-1993
DE 3929819 A	04-10-1990	DE 8903821 U	08-06-1989